MODIS semi-anual report January-June, 1993

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1. Algorithm Development

Work has been started on development of theoretical algorithms on the following topics:

- Remote sensing of aerosol loading and size distribution, by Y. J. Kaufman and D. Tanré. The algorithm involves remote sensing over ocean of the aerosol optical thickness and size distribution and remote sensing over the land of the aerrosol optical thickness only.

- Atmospheric corrections for the surface reflectance, by L. Remer and E. Vermote with C. Justice, Y.J. Kaufman and D. Tanré. The algorithm will correct for molecular scattering and gaseous absoprtion at launch, and for aerosol effects after launch when the quality of the aerosol data over the land will be verified. The algorithm also addresses corrections for adjacency effects and cirrus contamination.

- Remote sensing of water vapor in the near-IR by B.-C. Gao and Y.J. Kaufman. The algorithm will be based on a ratio between one of the water vapor absorption bands and a weighted average of the near IR window channels. The results from the 3 water vapor bands is weighed based on the resulting total water vapor amount.

We expect to finish the algorithms by the end of July or early August.

2. SCAR-A experiment

The SCAR-A (Sulfates, Clouds And Radiation experiment - America) was designed. The design of the experiment was preceeded by a meeting with all the participants. The main scientific purpose of the experiment is to perform simultaneous remote sensing (from AVHRR, Landsat, MAS and AVIRIS and from a ground based network of sunphotometers / sky radiometers) and in situ measurements (from the instrumented plane of the P. Hobbs group in U. of Washington) of the aerosol and cloud properties. This data set will be used in the development and for validation of the algorithms being developed for MODIS. The experiment is a collaboration between our group with that of Mike King and Paul Menzel as well as the P. Hobbs group leaded by D. Hegg. Tim Suttles from NASA HQ and Dave Mac Dougal from NASA / Langley are taking a leading role in managing the experiment and linking it to the future SCAR experiment in Brazil. The experiment will take place July 12-July 28.

3. Aerosol Topical meeting on remote sensing of aerosol and atmospheric

corrections from MODIS and EOS

The meeting was called for by the MODIS team members that are associated with remote sensing of aerosol and atmospheric corrections. The decision to call for the meeting resulted from the need for closer communication and collaboration between scientists developing methods for correction of atmospheric effect over the oceans, correction over the land and remote sensing of aerosol above the ocean and the land. A closer communication with the "outside MODIS" scientific community was also recognized as being needed. Scientists working on AVHRR, MISR, POLDER, EOS-P and Japanese sensors were also invited to review the MODIS activity and report on their developments that can be relevant to the MODIS algorithm development. Scientific managers from NASA / HQR were also invited and took place in the proceedings. The objectives of the meeting were:

- To review the science and algorithms for the analysis of MODIS data for remote sensing of aerosol and for atmospheric corrections.

- To compare and generate a stronger link between the algorithms for correction of atmospheric effects over the oceans and correction over the land.

- To review new methods for remote sensing of aerosol over the oceans and compare them with by-products of atmospheric correction over the oceans.

- To review the algorithms and products anticipated from other sensors available simultaneously with MODIS in order to consider their use in the MODIS activity.

- To review the main unresolved scientific issues regarding remote sensing of aerosol and atmospheric corrections.

- To review the planned activity for validation of the MODIS products.

The meeting was very informative with participation of 30 scientists. A summary of the meeting was submitted to Mike King for the EOS observer.

4. Remote sensing of aerosol from space

Further work have been done on the relation of the surface reflectance in the mid IR to the reflectance in the blue and red MODIS channels, in order to enable remote sensing of aerosol over the land.

5. The MODIS 1.375 µm channel.

An extended abstract was written by B.-C. Gao and Y. J. Kaufman to the SPIE meeting in Florida on the application of the new 1.375 µm channel on MODIS for remote sensing of cirrus clouds and stratospheric aerosols. The channel is centered at 1.375 µm, the strong water vapor absorption region, with a width of 30 nm. B.-C. Gao

presented the paper.

6. Interaction of smoke particles with clouds

The AVHRR data of smoke and clouds over Brazil was reanalyzed in order to look for the effect of smoke on thin clouds. The work is being done by Y. J. Kaufman, R.S. Fraser and M. Lawrence (a summer student in 1992). The results were presented in the first IGAC conference in Eilat in April. While for the thicker and higher clouds a larger effect was found on their microphysics, since the initial aerosol concentration in that altitudes is lower, the albedo did not change since they were already bright and the extra brightness due to extra CCN is compensated by absorption by graphitic carbon. For the lower thiner clouds, the change in the microphysics was smaller, but the clouds did become brighter. These effects were more pronounced in the central part of the Amazon basin where deforestation fires take place and there is a larger variability in the smoke concetration. The effect was much smaller in the southern part where Cerrado fires are dominant, due to the diffusiveness of the process (high CCN background) and the larger fraction of graphitic carbon in the air. A paper is being written on this issue.

7. IGAP

A new international activity sponsored by the WMO: IGAP- International Global Aeosol Project was initiatied. Y. J. Kaufman chairs the biomass burning aerosol project. A workshop was held in Geneva in June. In the workshop a first draft of IGAP was drafted. The SCAR experiments are the main biomass burning activity of IGAP.

8. Aerosol research in Lille

Y. J. Kaufman traveled to Lille to work with Didier Tanré on an aerosol model that describes the effect of fluctuations in the cloud supersaturation on the aerosol size distribution and on their climatic effects. In this trip Y. J. Kaufman also collaborated with D. Tanré on the algorithm for remote sensing of aerosol from space, and in particular on the inovative technique of D. Tanré for remote sensing of aerosol over the oceans.

9. Near future activity:

- SCAR-A experiment, July 1993; analysis of data.

- Planning for SCAR-C experiment in California, Sept. 1994.

- Development of software for remote sensing of water vapor and aerosol and atmospheric corrections

- Development of a data set of the spectral and angular characteristics of surface covers in the presence and absence of aerosol for simulation and validation of the

algorithms.

- Close collaboration with D. Tanré on the algorithm for remote sensing of aerosol over the oceans.

10. Problems: Closer collaboration with D. Tanré by bringing him to the US for extended periods of time in addition to frequent mutual visits.